REMARKS

Applicant thanks the Examiner for acknowledging receipt of Applicant's foreign priority documents that have been submitted pursuant to 35 U.S.C. §119. Applicant has amended the claims in order to overcome the Examiner's rejections 35 U.S.C. §112, second paragraph. Applicant respectfully submits that the amended claims comport with all of the requirements of §112 and accordingly Applicant respectfully requests that the Examiner now withdraw these rejections.

Applicant respectfully requests reconsideration of the prior art rejections set forth by the Examiner under 35 U.S.C. §§ 102 and 103. Applicant respectfully submits that the prior art references of record, whether considered alone, or in combination, fail to either teach or suggest Applicant's presently claimed invention. Applicant notes that the primary prior art reference upon which the Examiner relies in rejecting the claims, the McCartney United States patent No. 5,657,105, is actually directed to a technique that is less capable than the prior art discussed with reference to Figure 7 in Applicant's specification at p. 2-3.

Applicant's claimed invention is directed to new and improved liquid crystal displays and methods of manufacturing the improved displays wherein the resultant liquid crystal display provides a clearer and brighter image over a wider range of viewing angles. Applicant's Specification notes that in order to overcome the deficiencies present in the prior art techniques for processing of a display via mechanical rubbing in order to achieve the desired alignment relationships for the alignment films that are formed adjacent to the liquid crystal material, it has been known to utilize photo-alignment control techniques as noted in the Specification (see - pages 2-3).

In order to achieve photo-alignment control, the polarized direction of ultraviolet light that is irradiated on an organic alignment film is adjusted. Use of this technique

prevents the occurrence of damage to the display due to dust from the prior art rubbing process.

As noted in the Specification, the previous approach to the use of photo-alignment of a display involved performing liquid crystal alignment treatment by irradiating liquid crystal alignment films for upper and lower boards in four respective divided areas of one dot as shown in Figure 7. Accordingly, the selective application of the polarized ultraviolet ray results in alignments of the lower substrate in one direction and on the upper substrate in another direction for each of the four regions of a dot shown in Figure 7. See specifically, Applicant's Specification on page 2, lines 15-30. The primary viewing angles for these regions are indicated by the star and the overall view is a mixture of the viewing angle characteristics. As a result, the undesirable characteristics of the earlier prior art have been reduced.

However, even in a liquid crystal display of this design wherein one dot is divided into two or four areas, alignment disorder occurs at boundaries of the divided areas and it is necessary to shade the upper substrate where a color filter is formed from rays penetrating the divided regions. It is thus necessary to dispose shading areas not only between dots but also crossing areas within a dot as denoted by the reference numerals 70a and 70b in Figure 7. As a result, the aperture ratio declines for a dot and there is a corresponding decrease in the transmission of that display and the overall display quality is therefore reduced. See Applicant's disclosure at page 3. The embodiment illustrated in Figure 7 is actually a prior art improvement over the primary prior art reference cited by the Examiner, the *McCartney* U.S. Patent No. 5,657,105.

The *McCartney* reference is merely directed to a multi-domain liquid crystal display wherein adjacent areas of the display are oriented in different directions through the use of coating the substrate and exposing a first set of areas to ultraviolet light from a source

polarized in a first direction and thereafter exposing the second set of various dot regions to ultraviolet light from a source of polarized in the second direction.

However, as shown in the *McCartney* reference, each dot has but a single polarization. Thus, although *McCartney* does generally teach the application of two different polarizations to respective different regions of the display, there is neither teaching nor suggestion regarding the presently claimed invention wherein each of a plurality of pixel or dot regions of said display has a first alignment direction for a front alignment film portion of said pixel or dot and a second alignment direction for a back alignment film portion of said pixel or dot with no other alignment directions for said pixel or dot.

The presently claimed has overcome the shortcoming and deficiencies of the prior art by providing improved systems and methods for creating a liquid crystal display which do not suffer from the shortcomings of the display of Figure 7 or the prior art cited by the Examiner. In accordance with the claimed invention, in a first aspect a liquid crystal display includes a pair of transparent substrates with liquid crystal sandwiched between the substrate and respective alignment films formed on the surfaces of the respective substrates. The liquid crystal alignment films are aligned within each dot or pixel in two distinct directions without any other alignment directions within the dot or pixel. The liquid crystal alignment directions at two adjacent dots or two adjacent pixels differ from each other as claimed so that it is possible to achieve an intended primary viewing angle. See, Applicant's Specification at page 6, lines 1-14.

Accordingly, in light of the foregoing, Applicant respectfully submits that all claims now stand in condition for allowance. Applicants respectfully request that the Examiner now allow all claims in the application.

Respectfully submitted,

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CERTIFICATE OF MAILING

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CLEAN VERSION OF CLAIMS

1. A liquid crystal display comprising a pair of transparent substrates, a liquid crystal sandwiched between said pair of transparent substrates, and liquid crystal alignment films formed between side surfaces of said respective transparent substrates and said liquid crystal, wherein:

each of a plurality of dot regions of said display has a first alignment direction for a front alignment film portion of said dot and a second alignment direction for a back alignment film portion of said dot with no other alignment directions for said dot.

2. A liquid crystal comprising a pair of transparent substrates, a liquid crystal sandwiched between said pair of transparent substrates, and liquid crystal alignment films formed between side surfaces of said respective transparent substrates and said liquid crystal, wherein:

each of a plurality of pixel regions of said display has a first alignment direction for a front alignment film portion of said pixel and a second alignment direction for a back alignment film portion of said pixel with no other alignment directions for said pixel.

3. The liquid crystal display element according to claim 1, wherein four closely arranged dot regions each have two different alignment directions for the respective front and back alignment films and none of the four dot regions share two common alignment directions.

4. The liquid crystal display element according to claim 2, wherein said liquid crystal alignment directions are in opposite directions for each of the alignment films at respective regions of the alignment films corresponding to adjacent pixels.

6. The liquid crystal display element according to claim 2, wherein each of four closely arranged pixel regions do not share two common alignment directions .

7. The liquid crystal display element according to claim 2, wherein adjacent pixels do not share two common alignment directions.

8. A method for manufacturing a liquid crystal display element including a pair of transparent substrates, a liquid crystal sandwiched between said pair of transparent substrates, and liquid crystal alignment films formed between side surfaces of said respective transparent substrates and said liquid crystal, said method comprising the steps of:

forming ultraviolet light responsive type liquid crystal alignment films over first sides of said pair of transparent substrates; and

irradiating the alignment films such that each of a plurality of dot regions of said display has a first alignment direction for a front alignment film portion of said dot and a second alignment direction for a back alignment film portion of said dot with no other alignment directions for said dot.

9. The method for manufacturing a liquid crystal display element according to claim 8, wherein four closely arranged dot regions each have two different alignment directions and none of the four dot regions share two common alignment directions.

10. The method for manufacturing a liquid crystal display element according to claim 8, wherein said liquid crystal alignment directions are in opposite directions for each of

the alignment films at respective regions of the alignment films corresponding to adjacent dots.

11. A method for manufacturing a liquid crystal display element including a pair of transparent substrates, a liquid crystal sandwiched between said pair of transparent substrates, and liquid crystal alignment films formed between liquid crystal side surfaces of said respective transparent substrates and said liquid crystal, said method comprising the steps of:

forming ultraviolet light responsive type liquid crystal alignment films over first sides of said pair of transparent substrates; and

irradiating the alignment films such that each of a plurality of pixel regions of said display has a first alignment direction for a front alignment film portion of said pixel and a second alignment direction for a back alignment film portion of said pixel with no other alignment directions for said pixel.

12. The method for manufacturing a liquid crystal display element according to claim 11, wherein each of four closely arranged pixel regions do not share two common alignment directions.

13. The method for manufacturing a liquid crystal display element according to claim 11, wherein adjacent pixels do not share two common alignment directions.